

# UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL DESIGN HANDBOOK

## CHAPTER 1

### INTRODUCTION

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## CHAPTER 1

### INTRODUCTION

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#### 1.1. Environmental Management Program

The Upper Mississippi River System Environmental Management Program (EMP) is successfully implementing innovative and effective habitat projects and conducting cutting-edge monitoring and research. First authorized in Section 1103 of the Water Resources Development Act of 1986, the EMP has made significant contributions to ensure that the Upper Mississippi River System remains a nationally significant ecosystem. The Upper Mississippi River System is shown in figure 1.1.



Figure 1.1. Upper Mississippi River Basin

## **1.2. Habitat Rehabilitation and Enhancement Projects**

Fish and wildlife on the Upper Mississippi River System has been declining in quantity, quality and habitat diversity for decades. Much of this decline is associated with human activity throughout the basin, including upland land use and development, floodplain farming and development, and changes brought about by the system's 9-foot channel navigation project. While the decline is caused by a variety of factors, some of which the EMP cannot address, Habitat Rehabilitation and Enhancement Projects (HREPs) are seeking to modify the river's floodplain structure and hydrology to counteract the effects of an aging impounded river system. For example, HREPs may alter sediment transport and deposition, water levels, or the connections between the river and its floodplain. These types of physical changes subsequently affect water quality parameters such as temperature, dissolved oxygen, and distribution of suspended sediments, thereby ultimately improving fish and wildlife habitat. The EMP restoration planning approach and techniques have served both nationally and internationally as models for other river restoration planners. Individual HREP locations are shown in figure 1.2.

## **1.3. HREP Impacts**

When the EMP began, HREP designers implemented and refined construction techniques in ways not previously imagined. The intent was to improve habitat through site-specific modifications. Since 1986, the HREP component has evolved into a successful program that combines a broad range of construction techniques with approaches that strive to use or mimic natural riverine processes, providing benefits to the river at system, reach, pool and local scales. In 2006, the EMP had provided more than \$145,508 for 86 projects which had been completed or implemented since 1987. Over 146,000 acres are expected to be impacted with completed and proposed projects (according to 2006 information). As of 2004, the EMP had completed 40 HREPs, improving fish and wildlife habitat on almost 67,000 acres. Another 8 HREPs were under construction and 16 projects were in various stages of design. These additional 24 projects are expected to improve approximately 74,000 acres of additional habitat. A summary of these projects, as of July 2006, is shown in figure 1.3.

## **1.4. HREP Feature Components**

To accomplish their habitat management and restoration objectives, HREPs employ a variety of techniques including: island creation, shoreline protection, water level management, backwater dredging, river training structures, secondary channel modification, aeration, floodplain restoration, reforestation and vegetation, and tributary restoration. Many projects combine these features to address more complex problems. The range of techniques that have been used, or are being considered for possible future use is extensive, and is shown in table 1.1. A list of project features at each project site is shown in table 1.2 .

## **1.5. HREP Documentation**

There has been significant documentation on individual HREPs, including feasibility level studies known as Definite Project Reports, as-built construction drawings, operation and maintenance manuals, and performance evaluation reports. However, these reports have generally been project specific, and often do not describe project lessons learned. Several of these documents are available electronically on the internet at the EMP web page: <http://www.mvr.usace.army.mil/EMP/default.htm>

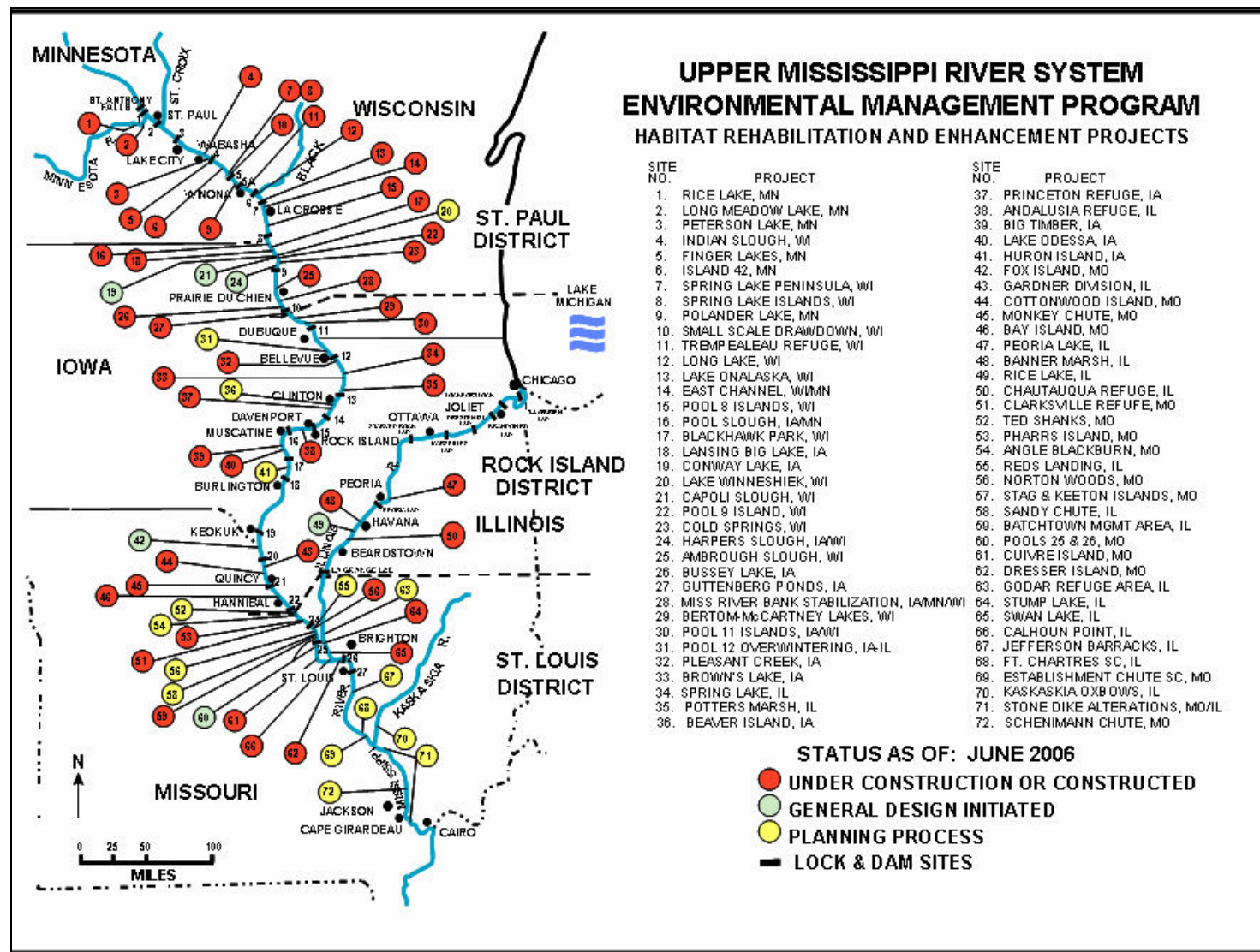


Figure 1.2. Habitat Rehabilitation and Enhancement Projects



## UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM



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of Engineers®**

### Summary of EMP Projects

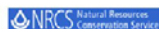
The Environmental Management Program has provided more **\$145,508,517** in funding for  
**86** Habitat Restoration and Enhancement projects since **1987**.

#### Number of Restoration Projects by Legislative District

IA-01 - 7	IA-02 - 3	IA-04 - 4	IL-12 - 6	IL-16 - 3
IL-17 - 13	IL-18 - 4	MN-01 - 5	MN-02 - 1	MN-03 - 1
MO-02 - 7	MO-03 - 1	MO-08 - 3	MO-09 - 11	WI-03 - 17

### EMP Project Results

<u>Restoration Features</u>		<u>Acres Affected</u>		
<u>Feature</u>	<u>Number of Projects</u>	<u>Stage</u>	<u>Number of Projects</u>	<u>Acreage</u>
Backwater Dredging	31	Proposed	30	19,760
Water Level Management	43	Initiated	16	50,528
Islands	15	Complete	40	76,645
Bank Stabilization	16	<b>Total</b>	<b>86</b>	<b>146,933</b>
Side Channel Restoration	42	<u>Habitat Benefits</u>		
Water Aeration	5	<u>Type</u>		<u>Acreage</u>
Moist Soil Management Unit	22	Main Channel Habitat		
Reforestation/Revegetation	23	Secondary Channel Habitat		
Other (i.e. Access Road)	22	Contiguous Backwater		
		Isolated Backwater Habitat		
		Island Habitat		



**Figure 1.3.** Summary of EMP Projects (July 2006)

**Table 1.1.** EMP HREP Features

Technique	Objectives
Dredge backwaters	Alter flow patterns and velocity Improve floodplain structural diversity Increase deep water fish habitat for overwintering Provide access for fish movements Provide dredged material to support revegetation and island building
Water Level Management	Restore natural hydrologic cycles Promote growth of aquatic plants as food for waterfowl Consolidate bottom sediments Control rough fish
Island Creation	Decrease wind and wave action Alter flow patterns and sediment transport Improve aquatic plant growth Improve floodplain structural diversity Provide nesting and loafing habitat for waterfowl and turtles Restore woody vegetation
Shoreline Stabilization	Prevent shoreline erosion Maintain floodplain structural diversity Create fish habitat Reduce sediment loads to backwaters Create barriers to waves and currents
Secondary Channel Modification	Improve fish habitat and water quality by altering inflows Stabilize eroding channel Reduce sediment load to backwaters by reducing flow velocities Maintain water temperature and provide rock substrate
Water aeration	Improve fish habitat and water quality by introducing oxygenated water
<b>Miscellaneous Experimental and Complementary Techniques</b>	
Seed islands	Isolated wetlands
Upland sediment control	Weirs
Land Acquisition	Rock sills
Riffle pools	Sediment traps
Potholes	Mussel substrates
Notched wing dams	Bottomland forest restoration
Anchor tree clumps	Vegetative plantings

**Table 1.2.** HREP Feature Components

Project Name	Status	Acres Affected	Backwater Dredging	Water Level Management	Islands	Bank Stabilization	Side Channel Restoration & Enhancement	Aeration	MSMU	Reforestation & Revegetation	Other
Alton Pool Side Channels	Proposed	0.00					X				
Ambrough Slough	Complete	2,500.00	X	X			X	X			
Andalusia	Complete	393.00		X	X		X				X
Angle Blackburn Islands	Proposed	500.00	X				X		X		
Baldwin Backwater Protection	Proposed	0.00	X	X			X				
Bank Stabilization	Complete	1,500.00		X		X	X				
Banner Marsh	Complete	5,524.00		X						X	X
Batchtown	Initiated	3,300.00					X		X		
Bay Island	Complete	650.00		X					X	X	X
Beaver Island	Proposed	0.00									
Bertom McCartney Lakes	Complete	2,000.00	X	X							X
Big Timber	Complete	1,039.00	X	X						X	
Blackhawk Park	Complete	282.00					X				X
Brown's Lake	Complete	453.00	X	X			X			X	
Bussey Lake	Complete	213.00	X	X							
Calhoun Point	Initiated	2,300.00	X						X		
Capoli Slough	Initiated	600.00	X		X	X					
Clarence Cannon	Proposed	3,750.00	X	X		X				X	
Clarksville Refuge	Complete	325.00							X		
Cold Springs	Complete	35.00					X				
Conway Lake	Initiated	560.00	X	X	X			X			
Cottonwood Island	Complete	463.00	X				X			X	X
Cuivre Island	Complete	1,400.00		X			X				X
Dresser Island	Complete	940.00		X							
East Channel	Complete	70.00				X					
Establishment Chute	Proposed	0.00					X		X		
Finger Lakes	Complete	264.00		X							
Fox Island	Proposed	2,100.00		X						X	
Ft Chartres Side Channel	Proposed	100.00		X			X				X

**Table 1.3.** HREP Feature Components

Project Name	Status	Acres Affected	Backwater Dredging	Water Level Management	Islands	Bank Stabilization	Side Channel Restoration & Enhancement	Aeration	MSMU	Reforestation & Revegetation	Other
Glades Wetlands	Proposed	300.00	X	X					X		X
Godar Refuge	Proposed	300.00							X		
Guttenberg Waterfowl Ponds	Complete	50.00		X							X
Harpers Slough	Initiated	2,200.00			X	X					
Huron Island	Proposed	0.00									
Indian Slough	Complete	631.00	X	X			X				X
Island 42	Complete	95.00	X				X	X			
Jefferson Barracks	Proposed	0.00		X			X				X
Kaskaskia River Oxbows	Proposed	200.00		X			X				
Lake Chautauqua	Complete	4,200.00		X		X	X				X
Lake Odessa	Initiated	6,788.00	X	X			X		X	X	
Lake Onalaska	Complete	7,000.00			X	X	X	X			
Lake Winneshiek	Proposed	6,000.00	X		X						
Lansing Big Lake	Complete	9,755.00		X		X					
Least Tern	Proposed	0.00				X					X
Long Island (Gardner) Division	Initiated	6,000.00	X	X		X	X			X	
Long Lake	Complete	40.00		X			X				
Long Meadow Lake	Initiated	1,000.00		X						X	
Monkey Chute	Complete	88.00	X								
Norton Woods	Proposed	0.00	X							X	
Osborne Side Channel	Proposed	0.00					X				
Peoria Lake	Complete	14,000.00		X	X		X		X	X	
Peterson Lake	Complete	500.00		X		X	X				
Pharrs Island	Complete	600.00				X	X		X		X
Piasa - Eagle's Nest Islands	Proposed	0.00					X				
Pleasant Creek	Complete	2,350.00							X	X	
Polander Lake	Complete	1,000.00	X	X	X	X				X	



## **1.6. EMP Database**

A database for HREP projects was developed in the 1990s. This database was revised in 2005 and 2006 to a Microsoft Access database. The purpose of the database is to compile important information at each HREP site and allow the information to be shared and used for future projects. Output tables for the database can range from project specific fact sheets to program analysis of various feature impacts. The database is integrated with GIS data to allow for various query options. It is anticipated that the database, used in coordination with this handbook, will allow for more thorough and streamlined planning of future HREPs.

## **1.7. Report Format**

It was determined that a design handbook should be created to describe project features common in HREPs. The EMP program covers separate rivers and extends through several U.S. Army Corps of Engineers Districts, which requires some site specific attention be paid to new projects. However, there are numerous similarities in the design of these project features that the design process can be summarized in this document. Each chapter has been prepared by several different individuals, but in general the design methodology, case studies, lessons learned, and references are included in each chapter, which are as follows: Shoreline Stabilization; Localized Water Level Management; Dredging; River Training Structures and Secondary Channel Modifications; Aeration; Floodplain Restoration; Tributary Restoration; and Islands.

## **1.8. Report Preparation**

This document addresses techniques currently being used on the Upper Mississippi River System, or proposed for future projects. The handbook primarily addresses the physical characteristics of the process. Future work will focus on biological characteristics and will continue to incorporate lessons learned from both new and aging HREPs.

Work on this handbook was initiated in 2004. A multi-district team was created, and the handbook format was discussed in great detail during and EMP HREP Design Meeting in January 2005, held at the U.S. Army Corps of Engineers, Rock Island District Office. The recommended format was presented to the EMP Coordinating Committee (EMPCC) during their quarterly meetings. The EMPCC approved the final format. Primary authors were identified for each chapter and draft chapters were prepared by May 2005. The chapters were distributed to each district for reviews and to include their own district's information. All information was incorporated and an official draft report was completed in July 2005. In August 2005, the document was discussed at the EMP Workshop, held in Davenport, IA. Comments were received during this workshop. An invitation for comments was sent out to the EMPCC, service agencies, Corps employees, and others interested in the document. Comments were due by January 2006, however, due to emergency deployments by several individuals (in response to Hurricane Katrina, and the War in Iraq), the comment period was extended to May 2006. The comments were incorporated by the primary authors, and the final chapters were completed in July 2006.